

Application No. 09/317,409
Amendment dated October 5, 2004
Reply to Office Action dated April 9, 2004

REMARKS

Claim Objections

Claim 55 is objected to because of a formality. Appropriate correction has been made to claim 55 thereby overcoming this objection. Specifically, in line 17, "ore" has been changed to "core".

Claim Rejections – 35 USC §102/103

Claims 55 and 57-59 are rejected under 35 USC §102(e) for allegedly being anticipated by or, in the alternative, under 35 USC §103 for allegedly being obvious over Corbett et al. (5,895,699). This rejection is respectfully traversed.

Co-cured honeycomb sandwich structure comprising a honeycomb core and at least one prepreg ply (a fabric impregnated with a resin system) disposed on each surface of the honeycomb core are used throughout the aerospace industry in order to provide high mechanical strength at low densities. (Specification, page 1, lines 13-18).

A major problem of honeycomb sandwich structures is the tendency of the honeycomb core to crush during the autoclave process in manufacture. This problem is commonly referred to as "core crush." Core crush during the production of structures (e.g. airplane structures) render the structure useless and increases production cost due to direct labor, delays and material expenses. (Specification, page 1, lines 20-26). Core crush is known to occur due to differential movement during the autoclave process between the prepreg plies that comprise the honeycomb sandwich structure. This differential movement was believed by the industry to possibly occur late in the autoclave cycle when the resin system's viscosity is at a minimum. Thus, known methods utilized to reduce core crush during the autoclave process have focused on preventing the differential movement by either mechanical/physical means (i.e. using tie downs to keep the prepreg plies from differentially moving) or by chemical means focusing on the resin system (i.e. using a fast reacting resin system to permit increase of the viscosity of the resin system). (Specification, page 1, line 28 through page 2, line 2). However, known mechanical/physical means of reducing core crush may increase production costs due to increased labor costs. Moreover known chemical means of reducing core crush focusing on the resin system or other parameters of the autoclave process have sometimes failed to provide

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satisfactory reduction of core crush in known honeycomb sandwich structures. (Specification, page 2, lines 11-17).

In accordance with the present invention, it has been discovered that the ASTM stiffness value of the fabric component of prepreg plies and honeycomb sandwich structures can influence the differential movement of the prepreg plies, the core crush value and the void content of honeycomb sandwich structures. (Specification, page 5, lines 34-39). Accordingly, the present invention (claim 55) is directed to a prepreg of a honeycomb sandwich structure precursor including a honeycomb core, a stiffness-treated prepreg ply, a second prepreg ply and a resin system where the stiffness-treated prepreg ply and the second prepreg ply are disposed adjacent one another. The stiffness-treated prepreg ply comprises a stiffness-treated fabric including a plurality of fibers and a polymeric material disposed on at least some of the fibers, and exhibits an ASTM stiffness value not less than 7% greater than the ASTM stiffness value of an untreated fabric. When the stiffness-treated prepreg ply is disposed on the second prepreg ply comprising a resin system and a fabric selected from the group consisting of the stiffness-treated fabric and untreated fabrics, the frictional resistance exhibited between the stiffness-treated prepreg ply and the second prepreg ply is sufficiently greater than the frictional resistance between two untreated prepreg plies disposed on one another, where each of the two untreated prepreg plies comprises the resin system and an untreated fabric, so as to enhance resistance to core crush when autoclave pressures are raised to decrease void content of a honeycomb core during fabrication of a honeycomb core structure from the honeycomb core structure precursor.

The Office Action contends that "Corbett et al. teaches a core with two outer prepreg plies adjacent to each other in the skin layer. Both the skin layer and the tiedown plies would equate to Applicants claimed stiffness-treated fabric, a fabric with a polymeric material, ... disposed on at least some of the fibers." (April 9, 2004 Office Action, page 3, lines 11-15). Thus, the Office Action concludes, "the skin layers 102, the tiedown plies 175, and the adhesive layer 108 form Applicant's stiffness treated prepreg ply, second prepreg ply and resin system." (April 9, 2004 Office Action, page 3, lines 16-18).

The claimed stiffness treated prepreg ply is however not properly equated with either the skin layer or the tiedown plies of Corbett. Corbett, fails to teach or suggest the presently claimed

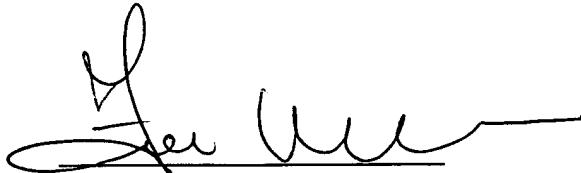
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feature wherein the stiffness treated fabric exhibits an ASTM stiffness value greater than, much less not less than 7% greater than, the ASTM stiffness value of an untreated fabric. By incorporating this stiffness treated fabric into the honeycomb sandwich structure of the present invention, the present invention eliminates the need for mechanical/physical means, such as the tie down plies of Corbett, for constraining the differential movement of the prepreg plies during cure. Corbett fails to teach or suggest any stiffening of fabrics used in the prepreg layers therein, nor does it teach or suggest the benefits associated therewith in the present invention. Claims 57-59 depend from and further limit claim 55. The present invention is therefore not anticipated by, or in the alternative, would not have been obvious over Corbett. Reconsideration and withdrawal of the rejection of claims 55 and 57-59 under 35 USC § 102(e) or in the alternative, 35 USC §103 are earnestly solicited.

In view of the foregoing this application is in condition for allowance. Favorable consideration and allowance of claim 55 and 57-59 are thus earnestly solicited.

Should the Examiner not yet consider this application in condition for allowance or have any question concerning this response, she is requested to telephone the undersigned at the number listed below.

Respectfully submitted,



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